

Variables: A Quest For The Unknown

Brief Overview:

This unit develops the concept of algebraic expressions. By discovering what is inside a locked treasure chest, students will gain understanding of the terms, *variable* and *expression*, write expressions from story situations, and evaluate expressions with and without parentheses. A prerequisite for this unit is an introductory lesson addressing the order of operations.

NCTM Content Standard:

Represent and analyze mathematical situations and structures using algebraic symbols.
Expectations:

- Represent the idea of a variable as an unknown quantity using a letter or symbol.
- Express mathematical relationships using equations.

Grade/Level:

Grades 4 – 5

Duration/Length:

Three 60 minute lessons

Student Outcomes:

Students will:

- Represent unknown quantities with one unknown and one operation (+, -, x, ÷ with no remainders)
- Determine the value of algebraic expressions with one unknown and one operation (+, -, x, ÷ with no remainders)
- Evaluate a numeric expression using parentheses

Materials and Resources:

Day 1

- Pre-test
- Treasure chest, 3 bags, and 47 gold coins to be organized as follows:
 - A locked box to serve as a treasure chest that contains 3 bags
 - Each bag contains 10 gold coins (available at party supply stores)
 - 15 loose gold coins at the bottom of the treasure chest
 - 2 gold coins to be kept outside the “treasure chest”
- Teacher Resource, Day 1, Model Situations
- Student Resource, Day 1, Independent Practice
- Student Resource, Day 1, Expressions Concentration

- Teacher Resource, Day 1, Expressions Reteach
- Sticky notes
- Student Resource, Day 1, Expressions Enrichment
- Student Resource, Day 1, Evaluation

Day 2

- Treasure chest materials from Day 1
- Student Resource, Day 2, Engagement
- Student Resource, Day 2, Independent Practice
- Student Resource, Day 2, Expressions BINGO
- White boards and markers
- Cubes; yellow, blue, white, green, and red
- Student Resource, Day 2, Reteach
- Student Resource, Day 2, Substituting Variables Enrichment
- Student Resource, Day 2, Evaluation
- Student computer access

Day 3

- Teacher Resource, Day 3, Engagement
- Treasure chest materials from Day 1
- Student Resource, Day 3, Independent Practice
- Student Resource, Day 3, Evaluation
- Student computer access

After Unit

- Post-test

Development/Procedures:

Day 1

Pre-assessment

- Distribute copies of the pre-assessment to students. Observe student responses. Use pre-assessment data to identify students that may need extra assistance during instruction.

Engagement

- Present students with the following problem: “Our class is preparing for a field trip! There are 28 students in our class and 7 chaperones are coming with us. If the groups must stay equal, how many students should be assigned to each chaperone?”

Exploration

- Present students with a locked “treasure chest” (Display Teacher Resource, Day 1, Model Situations). Tell them that a mysterious man delivered the chest to your room before school this morning. He told you that the chest contained gold coins just like these

(display 2 gold coins). You do not know how many coins are in the chest. Ask students for suggestions. Say, “How many could there be?”

- Ask students to use models or pencil/paper to represent the total number of coins that are in the chest.
- Next, ask students to use models or pencil/paper to represent the total number of coins that are in the chest *and* in your hand.
- Circulate the room to listen to student reasoning.
- Possible questions to ask:
 - “How are you trying to solve this problem?”
 - “What information do you have? What would you like to know?”
 - “Where did your number come from?”
 - “Do you think those two coins I displayed matter?”
 - “How can you write what you are trying to solve mathematically?”

Explanation

- Guide students in sharing answers with the class.
- Discuss the idea that the number of coins in the chest is not known. Ask students how the unknown can be represented.
- Model for students how to represent the problem as $c + 2$.
 - Introduce the term expression. Explain that an expression is a combination of numbers, variables, and operations. It represents a numeric value and NEVER contains an = sign. If it does, it is no longer an expression, but rather an equation.
 - Discuss the variable c and explain that you chose that letter to represent the number of coins. Explain that any letter would be acceptable and often, mathematicians use x or n . Define the term variable and explain how the same variable c could mean something different in another example, but in this example, the c represents only one numeric value. For example, in the expression $p + p + p + 5$, the p will always represent the same number such as 3. If the p were to be replaced by 3, the expression would then look like $3 + 3 + 3 + 5$. It is important to note that mathematicians use lower case letters as variables.
 - Ask students what other variable they could have used. Check for understanding by asking, “Does it matter which letter that you select?”
 - Discuss the two coins that you had in your hand already. Explain that the 2 coins must be included in the expression because they are part of the total even though they are not inside the treasure chest.
- Work through similar problems with each operation (Teacher Resource, Day 1, Model Situations). An answer key is provided.
 - Subtraction: “Red Beard the pirate broke into a treasure chest and stole 30 gold coins. How many gold coins are left in the chest?” Ask students, “What information do we not have in this situation?” Guide students to understand that they are missing the original number of coins in the situation, so that unknown number is represented by a variable. Instead of assigning the

variable, ask students to choose the variable to reinforce the idea that the variable can be any letter. The correct expression is $n - 30$.

- Multiplication: “There are 5 treasure chests. Each has the same number of gold coins in them. How many gold coins are there?” Again, ask students to identify the missing information. In this situation, the missing information is the number of coins in each treasure chest. Ask students to write an expression to represent the total number of gold coins. Many students will write the expression, $n + n + n + n + n$. Challenge students to write a multiplication expression since they are adding the same value repeatedly. After students share their expressions, explain that multiplication expressions can be written several ways: $5 \times n$, $5 \cdot n$, or the way preferred by mathematicians, $5n$. The 5 next to the n means that there are 5 n s and can be multiplied.
- Division: “An unknown number of gold coins are divided evenly into 3 treasure chests. How many gold coins are in each chest?” Challenge students to write a division expression two ways. After students share their expressions, explain that division expressions can be represented in different ways such as: $n \div 3$, or the way preferred by mathematicians, $\frac{n}{3}$. It is important to note that while either method is correct, students should expect to see the latter form.

Extension

- Students practice writing expressions from word problems (Student Resource, Day 1, Independent Practice).
- Students play expression concentration (Student Resource, Day 1, Matching Expressions Concentration Game Directions) individually or with a partner.

Differentiation

- Reteach
 - For students who require reteaching, organize a small group and ask students to write a number sentence for the following situation on a sentence strip (Teacher Resource, Day 1, Expressions Reteach). Say, “There are 50 gold coins in a treasure chest. Polly the Pirate adds 10 more coins. How many coins are there now?” Students are expected to write $50 + 10 = 60$. Explain to students that a number sentence is an equation and they are interested in only half of the equation, just the expression that got them the 60. Use scissors to cut off the equals sign and the 60, leaving only the expression. Next, remind students that they are used to getting all of the information in their word problems, but many situations do not give you all the information. Ask, “What if we didn’t know that the number of gold coins in the chest was 50?” Use a sticky note to cover up the 50. What could we put in its place? Some students may suggest a blank line or question mark based upon previous experiences. Explain to students that while those symbols work, mathematicians use lower case letters. Have students write a variable on the sticky note. Repeat the process for additional problems until students make the connection between the variable and the unknown.
- Enrich

- Students write expression stories to match a given expression (Student Resource Day 1, Expressions Enrichment).

Evaluation

- Students complete a four item assessment as an exit ticket (Student Resource, Day 1, Evaluation). An answer key is provided.

Day 2

Engagement

- Students match expressions to their stories and write expressions based on word problems (Student Resource, Day 2, Engagement). An answer key is provided.

Exploration

- Tell students that you have not been able to open the treasure chest yet, but are still working on it. Display yesterday's expression ($c + 2$) and ask students to think about how many gold coins could be in the chest. Say, "What if there were 250 gold coins inside the chest? How many total gold coins would we have?" Allow students time to evaluate the expression.
- Possible questions to ask:
 - "What does the 250 represent?"
 - "Where did the c go?"
 - "What does the 2 represent?"
 - "Does the c have to represent 250?"
 - "What else could c represent?"

Explanation

- Discuss student representations with the class.
- Model your thinking. Say, "If c represents the number of gold coins inside the treasure chest, and $c = 250$, then $250 + 2$ would be 252." Demonstrate for students that you re-wrote the expression, replacing the c with 250 to evaluate the expression.
- Explain to students that when they have a number for a variable, they can evaluate the expression by replacing the variable with the number and performing the operation.
- Connect the expression to the commutative property of addition. Ask, "Can anyone tell me which property of addition we can use in this expression?"
- Ask students to evaluate the expression for $c = 563$.
- Ask students to evaluate the expression for $c = 921$ to reinforce the idea that expression can be evaluated for $c =$ various values.

Extension

- Students practice evaluating expressions (Student Resource, Day 2, Independent Practice). An answer key is provided.
- Students practice evaluation expressions by playing Expressions BINGO (Student Resource Sheet, Day 2 Expressions Bingo).

Differentiation

- Reteach
 - For students who require reteaching, organize a small group and provide students with cubes, white boards, markers, and Day 2, reteach cards. Organize the cards into two piles; a pile of expression cards and a pile of number cards. A student turns over an expression card and uses the cubes to represent the expression. The letter of the variable indicates the color cubes to use and white cubes represent variables. For example, in the expression $12 - b$, students should line up 12 blue cubes and 1 white cube.
 - Next, another student turns over a number card to substitute for the variable. In the example $12 - b$, if a student turns over a card with the number 4, they should remove the white cube and take away 4 blue cubes to evaluate the expression. Students should say “The value of 12 take away b is 8”.
 - Students should repeat the process by turning over another expression card. If the card is an addition expression, such as $y + 9$, students should arrange 1 white cube for the variable and 9 yellow cubes. Another student should turn over a number card. Students should then remove the white cube and substitute the amount of yellow cubes that matches the number card. Students can then count the cubes to evaluate the expression.
 - Once students gain confidence using the cubes, introduce the white boards, asking students to transition from the cubes to the written expressions.
- Enrich
 - Evaluate expressions with decimals (Student Resource, Day 2, Substituting Variables Enrichment). An answer key is provided.
 - Website to evaluate an expression with one variable:
 - AAA Math
 - <http://www.aaastudy.com/equ723x2.htm>

Evaluation

- Students complete a 4 item assessment as an exit ticket (Student Resource, Day 2, Evaluation). An answer key is provided.

Day 3

Engagement

- The class evaluates a “living” expression (Teacher Resource Sheet, Day 3 Engagement) with students holding signs for numbers, variables, and operation symbols. Once the “expression” is standing in front of the classroom, other students from the class holding number cards will stand in front of the variable so the entire class can evaluate the expression. Students take turns so that the x value changes.

Exploration

- Tell students that you finally were able to open the treasure chest. Show students the inside of the chest where students will see 3 bags. Each bag contains 10 coins. In addition, there are some loose coins at the bottom of the chest. In addition, show students the 2 coins that were outside the chest from Days 1 and 2.
- Explain to students that now we know what the inside of the treasure chest looks like, we have to rewrite the expression: $3(10) + n + 2$, with n representing the number of loose coins at the bottom of the chest.
- Choose a student to count the loose coins. The student should count 15 loose coins at the bottom of the treasure chest.
- Ask students to evaluate the expression for $n = 15$. Ask them to use paper/pencil and models or pictures.
- Possible questions to ask:
 - “What operations are you using?”
 - “What does your variable represent?”
 - “What does your 3 represent?”
 - “Which did you do first?” and “Why?”
 - “What would happen if you added first?”

Explanation

- Allow students to explain to each other how they evaluated the expression.
- Rewrite the expression so that students see the 15: $3(10) + 15 + 2$
- Model your thinking for students as you evaluate the expression.
- Remind students of the order of operations, explaining why you multiplied before you added.
- Present students with an expression that will not be evaluated correctly if they do not follow the order of operations such as: $17 - (2 + 3)$.
- Ask students to evaluate the expression following the order of operations. They should get 12.
- Display 18 and tell students that was what you got. Say, “Is my answer correct?”
- Model evaluating expressions with the class with two more examples:

- $5 - 3 + (2 \cdot 3)$

- $\frac{15}{3} - (2 \cdot 2)$

Extension

- Students practice independently (Student Resource, Day 3, Independent Practice). An answer key is provided.

Differentiation

- Reteach
 - Websites to review and practice the order of operations
 - Video: Order of Operations
 - http://www.mathplayground.com/howto_pemdas.html

- Enrich
 - Websites to practice using the order of operations to evaluate more complex expressions and identify expressions to match situations:
 - Math Playground Order of Operations
 - http://www.mathplayground.com/order_of_operations.html
 - Math Playground Quick Calculate
 - http://www.mathplayground.com/quick_calculate.html
 - Escape from Planet X
 - <http://harcourtschool.com/>

Evaluation

- Students complete a 2 item assessment as an exit ticket (Student Resource, Day 3, Evaluation). An answer key is provided.

Summative Assessment:

The students will complete the summative assessment. The assessment consists of 10 selected response questions based on daily objectives and one brief constructed response based on “Day 2” objective. Answer key for assessment is provided.

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Name: _____ Date: _____

Pre-Assessment: Quest for the Unknown

Directions: Write the best response.

1. Hassan and his cousin, Kyle, collect baseball cards. Kyle has exactly 43 cards fewer in his collection. Let h represent the number of cards that Hassan has.

Write an expression which represents the number of baseball cards that Hassan has.

2. The school bus has 37 riders. At the next stop, some riders get on.

Write an expression to represent the number of bus riders.

3. The school bus has 37 riders. At the next stop, 7 riders get on.

Write an expression to represent the number of bus riders.

4. There are 80 students in the fourth grade. There are 10 tables in the cafeteria with an equal number of seats at each table. How many students sit at each table?

Write an expression to represent the number of students at each table.

5. My piggy bank has 12 dollars. My grandma sent me a check for my birthday. Write an expression to represent the money in my piggy bank now.

6. You have a job walking your neighbor's dog. Your neighbor pays you \$10 each week. How much money will you have earned if you walk the dog t weeks?

7. Evaluate the expression $5a$.

Let $a = 7$.

8. Evaluate the expression $\frac{n}{6}$.

Let $n = 36$.

9. Sasha has a bookshelf with 5 shelves. Each shelf holds the same number of books. Write an expression to represent this situation.

If $b = 39$, evaluate your expression.

10. Simplify the expression $8 + (5-3)$

11. Simplify the expression $6 (4 +4)$

Answer Key: Pre-Assessment: A Quest for the Unknown

Directions: Fill in the best response.

1. Hassan and his cousin, Kyle collect baseball cards. Kyle has exactly 43 cards less than Hassan in his collection. Let ***h*** represent the number of cards that Hassan has.

Write an expression which represents the number of baseball cards that Hassan has.

$h + 43$

2. The school bus has 37 riders. At the next stop, some riders get on.

Write an expression to represent the number of bus riders.

$37 + s$

3. The school bus has 37 riders. At the next stop, 7 riders get on.

Write an expression to represent the number of bus riders. Do not evaluate.

$37 + 7$

4. There are 80 students in the fourth grade. There are 10 tables in the cafeteria with an equal number of seats at each table. How many students sit at each table?

Write an expression to represent the number of students at each table.

$80 \div 10$

5. My piggy bank has 12 dollars. My grandma sent me a check for my birthday. Write an expression to represent the money in my piggy bank now.

$$12 + x$$

6. You have a job walking your neighbor's dog. Your neighbor pays you \$10 each week. How much money will you have earned if you walk the dog t weeks?

$$10t, 10 \times t, 10 \bullet t$$

7. Evaluate the expression $5a$.

Let $a = 7$.

$$35$$

8. Evaluate the expression $\frac{n}{6}$.

Let $n = 36$.

$$6$$

9. Sasha has a bookshelf with 5 shelves. Each shelf holds the same number of books. Write an expression to represent this situation. Use b to represent the variable.

If $b = 39$, evaluate your expression.

195

10. Simplify the expression $8 + (5 - 3)$

10

11. Simplify the expression $6(4 + 4)$

48

A mysterious man delivered the chest to our classroom before school this morning. He stated that the chest contained gold coins just like the two in my hand. We do not know how many coins there are in all.

How many could there be?

Red Beard the pirate broke into a treasure chest and stole 30 gold coins.

How many gold coins are left in the chest?

There are 5 treasure chests. Each has the same number of gold coins in them.

How many gold coins are there?

An unknown number of gold coins are divided evenly into 3 treasure chests.

How many gold coins are in each chest?



Name: _____ Date: _____

Independent Practice: Quest for the Unknown

Day 1: Represent unknown quantities with one unknown and one operation (+, -, \times , \div with no remainders)

Write an expression for each of the following situations.

1) 6 more than a number	2) 403 less than a number
3) twice a number	4) a number divided by twelve
5) a group of people split into 10 equal groups	6) students in a class increased by 4
7) eight cups of chocolate chips	8) a number decreased by 14



Name: _____ Date: _____

Answer Key (accept any variable)

Independent Practice: Quest for the Unknown

Day 1: Represent unknown quantities with one unknown and one operation (+, -, x, ÷ with no remainders)

Write an expression for each of the following situations.

<p>1) 6 more than a number</p> <p>$6 + x$</p>	<p>2) 403 less than a number</p> <p>$403 - x$</p>
<p>3) twice a number</p> <p>$2x, 2 \times x, 2 \bullet x$</p>	<p>4) a number divided by twelve</p> <p>$\frac{x}{12}, x \div 12, 12 \overline{)x}$</p>
<p>5) a group of people split into 10 equal groups</p> <p>$\frac{x}{10}, x \div 10, 10 \overline{)x}$</p>	<p>6) students in a class increased by 4</p> <p>$x + 4$</p>
<p>7) eight cups of chocolate chips</p> <p>$8x, 8 \times x, 8 \bullet x$</p>	<p>8) a number decreased by 14</p> <p>$x - 14$</p>

Matching Expressions Concentration Game Directions

1. Turn all of the cards over so that the words and algebraic expressions are face down. Arrange the cards into a rectangular grid (keep the words in one half of the rectangle and the algebraic expressions in the other half).
2. Have the first player take his turn. The first player turns over one word card and one algebraic expression card. The player collects the two cards if the words match the algebraic expression. Otherwise, the two cards are turned back over and it is the next player's turn. A player that makes a match takes another turn, and continues to take turns until they fail to make a match.
3. Continue to take turns until all of the matches are made.
4. Have each player count up his matches. The player with the most matches wins.

$$n + 7$$

The crew of *The Nino* had many maps. They found seven more in a treasure chest.

$$n - 7$$

The Jordan Empire has many crowns for the members of the royal family. A crew of *The Santamarino* stole seven crowns.

$$n \times 7$$

Each day of the week the pirates on *The Nino* receive a ration of fish.

$$n \div 7$$

After finding a large booty on an island in the South Seas, the seven members of *The Pinto* evenly split the booty amongst themselves.

$$\mathbf{n + 5}$$

The crew of the *The Pinto* had some shields. When they captured the crew of *The Nino* they got five more.

$$\mathbf{n - 5}$$

The crew of the *The Santamarino* has five less medallions than the crew of *The Pinto*.

$$\mathbf{n \times 5}$$

Each week the members of the crew of *The Pinto* earn a salary of five shillings for their work.

$$\mathbf{n \div 5}$$

The crew of *The Nino* brought a bag of birdseed for the parrot for the 5 week voyage and gave the parrot an equal amount each week.

$$\mathbf{n + 4}$$

The Pinto has four more trunks of gold than the *The Santamarino*.

$$\mathbf{n - 4}$$

The crew of the *The Santamarino* earns 4 schillings less than the Captain.

$$\mathbf{n \times 4}$$

Each ship has an equal number of crewmembers. There are four ships.

$$\mathbf{n \div 4}$$

The crew of *The Nino* assigns the watch duty into four equal shifts.

Expressions Reteach

$$50 + 10 = 60$$

There are 50 gold coins in a treasure chest. Polly the pirate adds 10 more coins. There are now 60 coins in the treasure chest.

$$25 + 30 = 55$$

Twenty five students in fourth grade are safety patrols. Thirty students in fifth grade are safety patrols. There are fifty - five total safety patrols in our school.

$$12 - 3 = 9$$

Myles brought twelve pencils to school. By the end of the day he lost three pencils. He now has nine pencils.

$$20 \div 5 = 4$$

There are 20 students in PE class today. Mr. Benco wants to have 5 equal teams. He has 4 students in each team.

$$3 \times 12 = 36$$

Mrs. Scott has 3 boxes of highlighters. There are 12 highlighters in each box. Mrs. Scott has 36 highlighters.

$$50 + 10 = 60$$

$$25 + 30 = 55$$

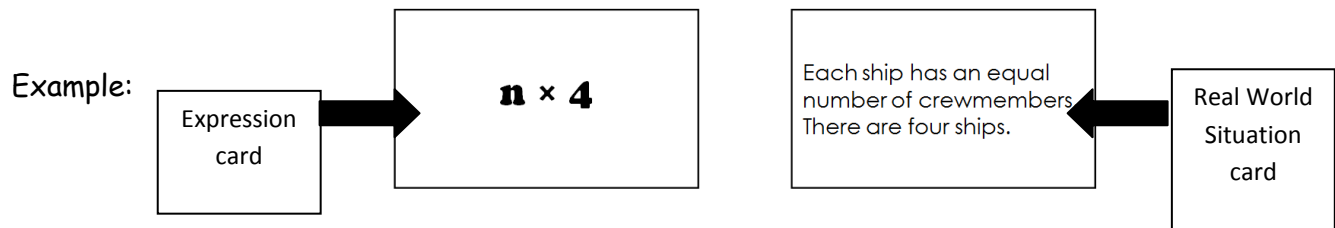
$$12 - 3 = 9$$

$$20 \div 5 = 4$$

$$3 \times 12 = 36$$

Expressions Enrichment

Create your own expressions and matching real world situations. When you are finished, have your teacher check that each situation matches each expression. Then cut the cards apart and see if a partner can match your expressions and situations.



Expression

Real world situation

Expression

Real world situation

Expression

Real world situation

Expression

Real world situation

Diagram illustrating a single neuron structure. The cell body contains a nucleus. The axon is labeled, and the expression is indicated below it.

Real world situation

Expression

Real world situation

Expression

Real world situation



Name: _____ Date: _____

Evaluation: Quest for the Unknown

Day 1: Represent unknown quantities with one unknown and one operation (+, -, \times , \div with no remainders)

1. Liza saw 6 shiny gems in the treasure chest. She knew that some gems had already been removed. Write an expression which represents the amount of gems that were once in the treasure chest.

2. Bryan and his two classmates noticed there were many coins in the treasure chest. They wondered how many coins each of them would have if they could take home equal amounts. Write an expression which represents the amount of coins each would take home.

3. Eric liked the golden cups he saw in the treasure chest. He brought two back to his desk to explore the details. His friend wanted to know how many cups were still in the chest. Write an expression to represent the number of cups that are left in the treasure chest.

4. Mia noticed that she had taken twice as many silver coins from the treasure chest as Reggie. Write an expression to represent the amount of coins that Mia took.



Name: _____ Date: _____

Answer Key

Evaluation: Quest for the Unknown

Day 1: Represent unknown quantities with one unknown and one operation (+, -, x, ÷ with no remainders)

1. Liza saw 6 shiny gems in the treasure chest. She knew that some gems had already been removed. Write an expression which represents the amount of gems that were once in the treasure chest.

_____ ($6 + g$, accept any variable)

2. Bryan and his two classmates noticed there were many coins in the treasure chest. They wondered how many coins each of them would have if they could take home equal amounts. Write an expression which represents the amount of coins each would take home.

_____ ($c \div 3$, $\frac{c}{3}$, $3\overline{)c}$, accept any variable)

3. Eric liked the brass cups he saw in the treasure chest. He brought two back to his desk to explore the details. His friend wanted to know how many cups were still in the chest. Write an expression to represent the number of cups that are left in the treasure chest.

_____ ($b-2$, accept any variable)

4. Mia noticed that she had taken twice as many silver coins from the treasure chest as Reggie. Write an expression to represent the amount of coins that Mia took.

_____ ($2s$, $2 \times s$, $2 \bullet s$, accept any variable)

Name: _____ Date: _____



Engagement: Quest for the Unknown

Day 2: Draw a line to match the situation

Four less than a number	$c \div 9$
5 times a number	$n - 4$
A bag of candy split by 9 friends	$5b$

Name: _____ Date: _____



Engagement: Quest for the Unknown

Day 2: Draw a line to match the situation

Four less than a number	$c \div 9$
5 times a number	$n - 4$
A bag of candy split by 9 friends	$5b$

Name: _____ Date: _____



Answer Key

Engagement: Quest for the Unknown

Day 2: Draw a line to match the situation

Four less than a number	$c \div 9$
5 times a number	$n - 4$
A bag of candy split by 9 friends	$5b$

Name: _____ Date: _____

Independent Practice: Quest for the Unknown



Day 2: Evaluate algebraic expressions with one unknown and one operation (+, -, \times , \div with no remainders).

Evaluate the expressions.

<p>1) $8n$</p> <p>$n = 6$</p> <p>Answer: _____</p>	<p>2) $b \div 4$</p> <p>$b = 48$</p> <p>Answer: _____</p>
<p>3) $m + 27$</p> <p>$m = 532$</p> <p>Answer: _____</p>	<p>4) $d - 17$</p> <p>$d = 412$</p> <p>Answer: _____</p>
<p>5) $\frac{42}{k}$</p> <p>$k = 6$</p> <p>Answer: _____</p>	<p>6) $246 - t$</p> <p>$t = 48$</p> <p>Answer: _____</p>
<p>7) $g \times 7$</p> <p>$g = 9$</p> <p>Answer: _____</p>	<p>8) $336 + p$</p> <p>$p = 24$</p> <p>Answer: _____</p>

Name: _____ Date: _____

Independent Practice: Quest for the Unknown



Answer Key

Day 2: Evaluate algebraic expressions with one unknown and one operation (+, -, \times , \div with no remainders).

Evaluate the expressions.

1) $8n$ $n = 6$ Answer: 48	2) $b \div 4$ $b = 48$ Answer: 12
3) $m + 27$ $m = 532$ Answer: 559	4) $d - 17$ $d = 412$ Answer: 395
5) $\frac{42}{k}$ $k = 6$ Answer: 7	6) $246 - t$ $t = 48$ Answer: 198
7) $g \times 7$ $g = 9$ Answer: 63	8) $336 + p$ $p = 24$ Answer: 560

Expressions Bingo

		FREE		

Answer Bank

1	2	3	4	5	5	6	6
7	7	8	8	9	9	10	12
12	13	13	15	16	16	17	19
20	24	27	32	48	49	75	99

$$6 + f$$

$$f = 7$$

$$e + 3$$

$$e = 14$$

$$7 + m$$

$$m = 8$$

$$n + 9$$

$$n = 3$$

$$12 + u$$

$$u = 4$$

$$s + 14$$

$$s = 6$$

$$13 + x$$

$$x = 6$$

$$y + 4$$

$$y = 8$$

$$17 - c$$

$$c = 9$$

$$d - 7$$

$$d = 8$$

$$23 - p$$

$$p = 16$$

$$n - 2$$

$$n = 11$$

$$36 - h$$

$$h = 31$$

$$g - 5$$

$$g = 11$$

$$18 - r$$

$$r = 5$$

$$q - 49$$

$$q = 51$$

$$3 \times a$$

$$a = 9$$

$$b \times 15$$

$$b = 5$$

$$7 \times j$$

$$j = 7$$

$$v \times 9$$

$$v = 11$$

$$12 \times k$$

$$k = 4$$

$$w \times 2$$

$$w = 8$$

$$8 \times r$$

$$r = 4$$

$$z \times 4$$

$$z = 6$$

$$63 \div a$$

$$a = 7$$

$$t \div 4$$

$$t = 40$$

$$36 \div m$$

$$m = 6$$

$$v \div 4$$

$$v = 28$$

$$24 \div k$$

$$k = 3$$

$$w \div 11$$

$$w = 44$$

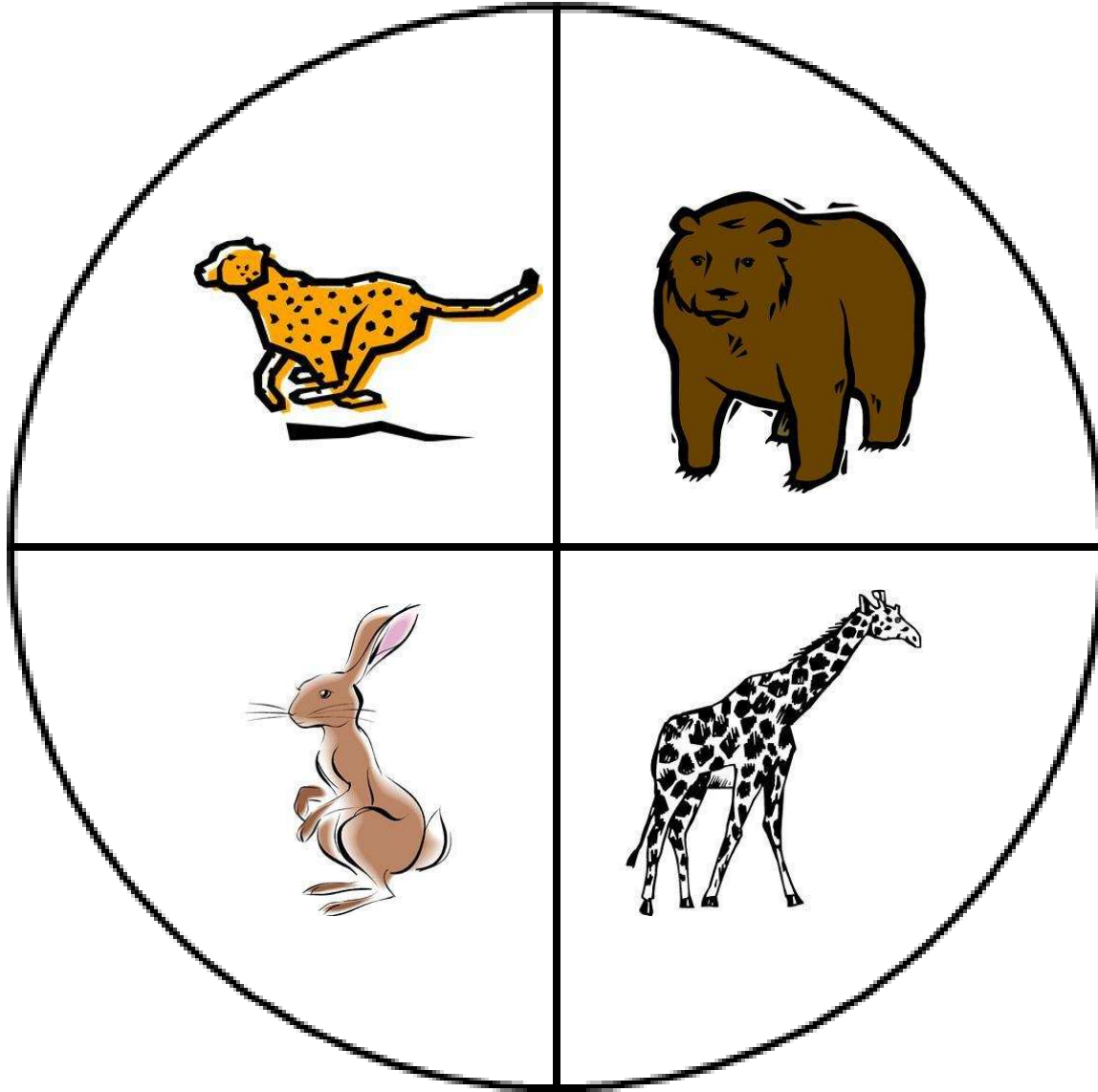
$$15 \div c$$

$$c = 3$$

$$z \div 10$$

$$z = 30$$

Spinner for Substituting Variables



$$4 + c$$

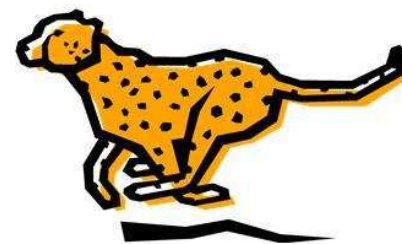
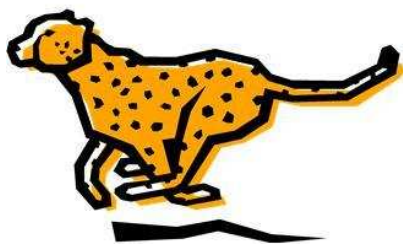
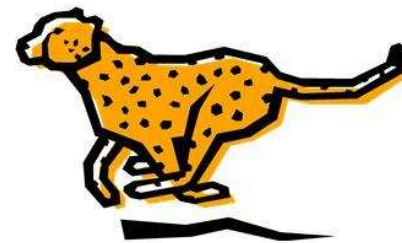
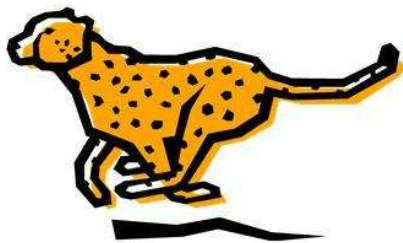
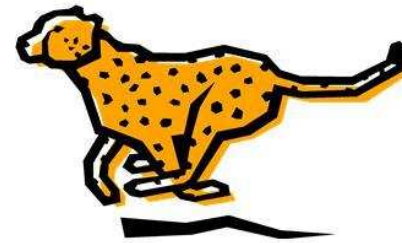
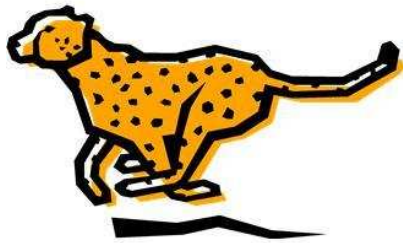
$$c + 8$$

$$6 + c$$

$$c + 3$$

$$7 + c$$

$$c + 9$$



$$c = 5$$

$$c = 6$$

$$c = 7$$

$$c = 8$$

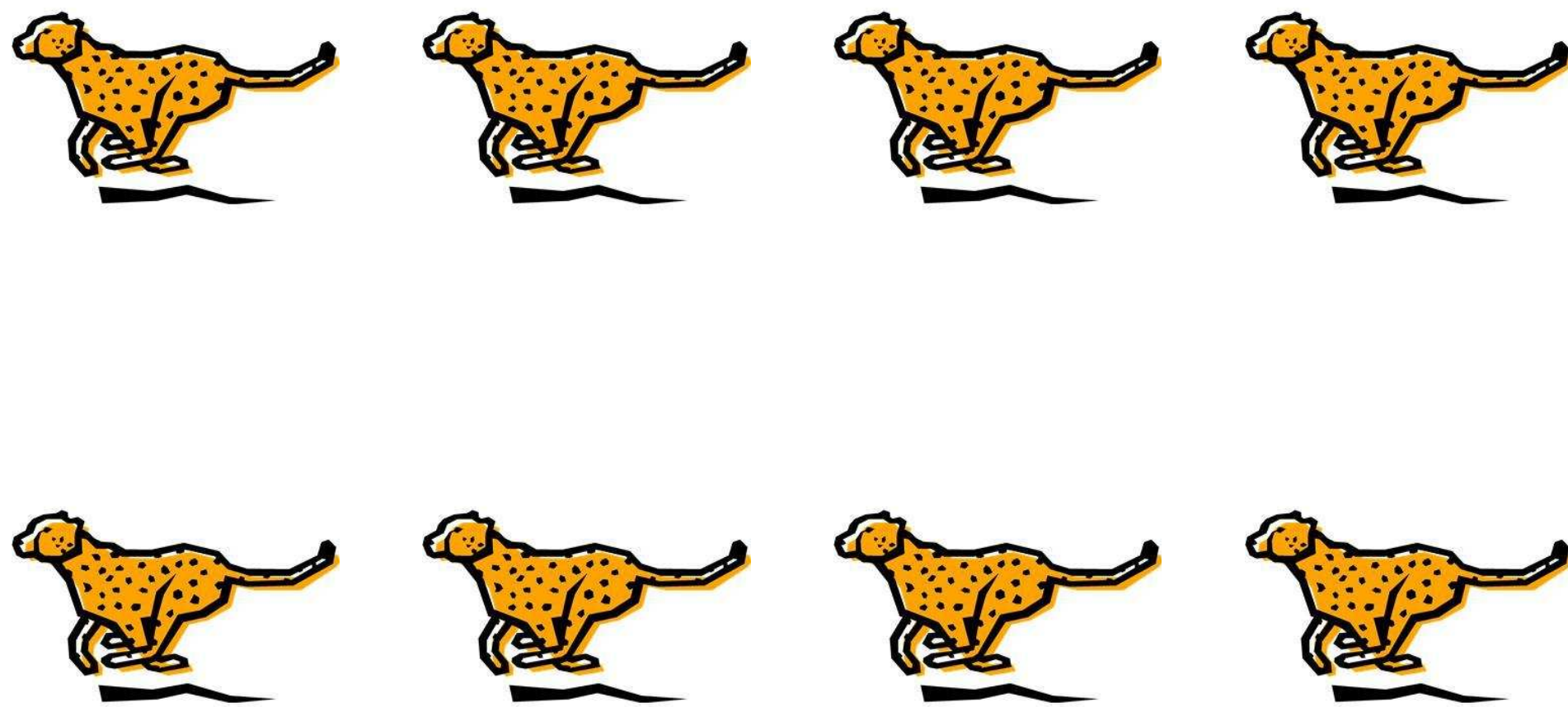
$$c = 9$$

$$c = 10$$

$$c = 11$$

$$c = 12$$

Addition



$$20 - b$$

$$12 - b$$

$$15 - b$$

$$17 - b$$

$$18 - b$$

$$19 - b$$



$$b = 5$$

$$b = 6$$

$$b = 7$$

$$b = 8$$

$$b = 9$$

$$b = 10$$

$$b = 11$$

$$b = 12$$

Multiplication



$$r \div 3$$

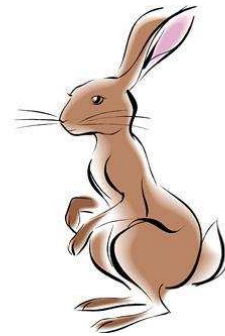
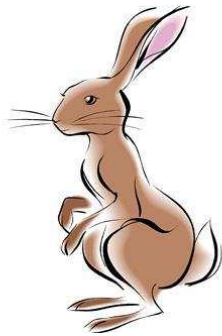
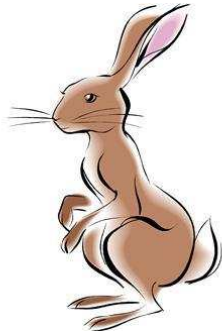
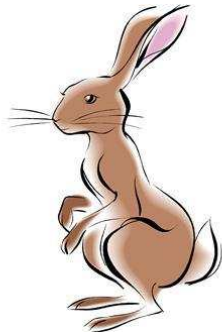
$$r \div 6$$

$$r \div 3$$

$$r \div 6$$

$$r \div 3$$

$$r \div 6$$



$$r = 12$$

$$r = 6$$

$$r = 18$$

$$r = 24$$

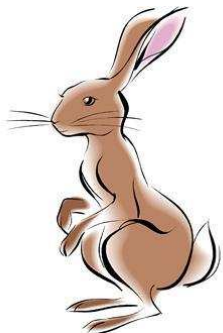
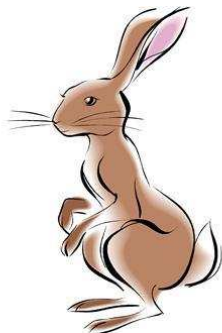
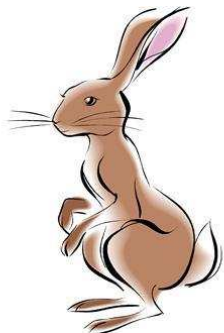
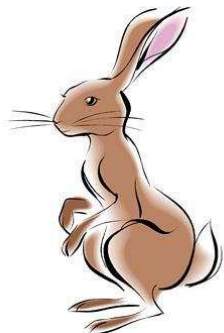
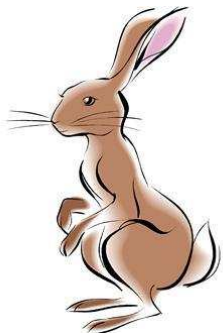
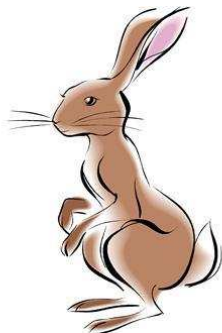
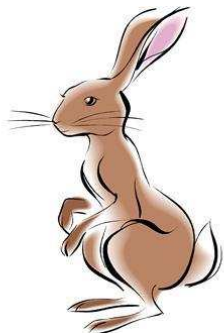
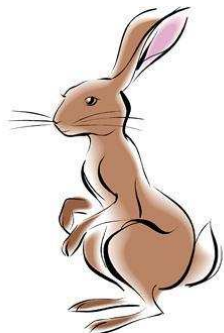
$$r = 30$$

$$r = 36$$

$$r = 42$$

$$r = 48$$

Multiplication



$$g \times 3$$

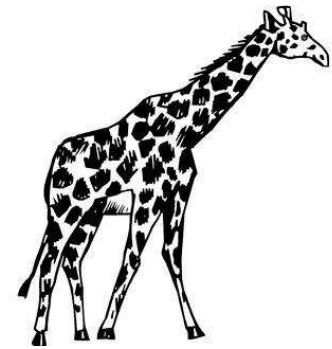
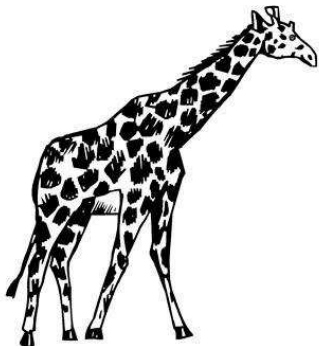
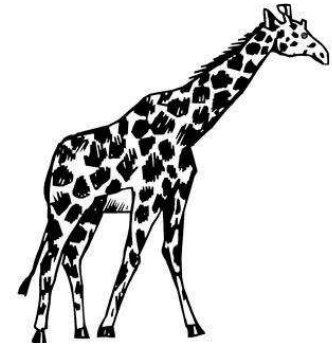
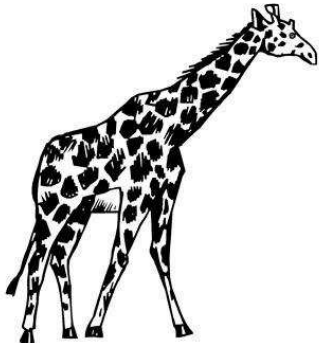
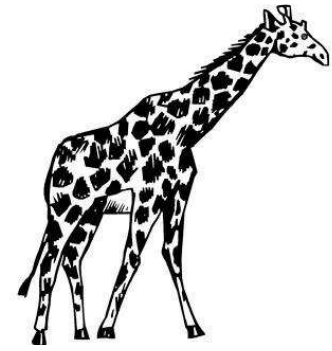
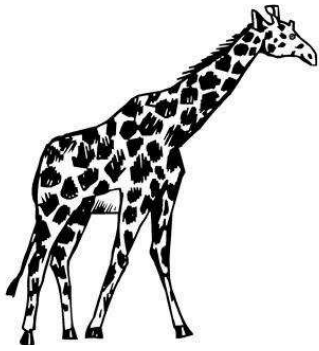
$$5 \times g$$

$$g \times 6$$

$$4 \times g$$

$$g \times 8$$

$$2 \times g$$



Multiplication

$$g = 5$$

$$g = 6$$

$$g = 7$$

$$g = 8$$

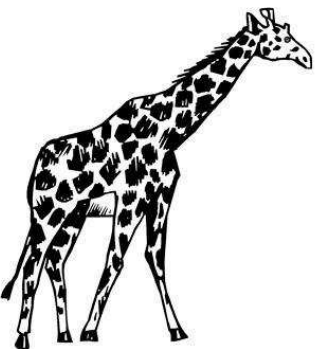
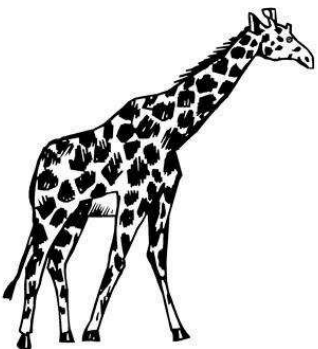
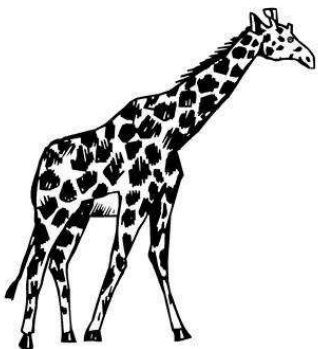
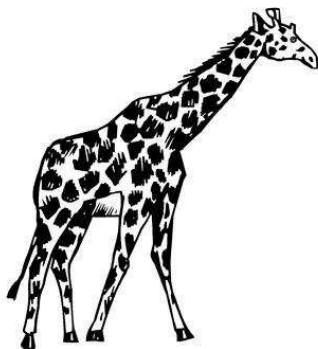
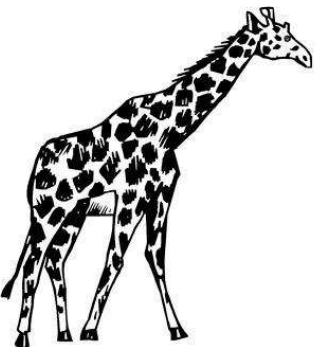
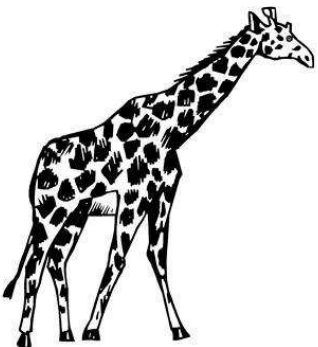
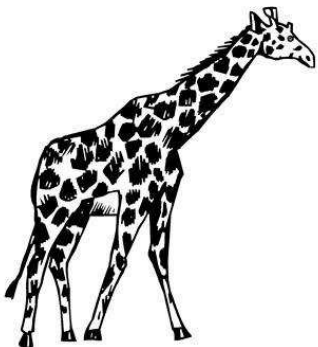
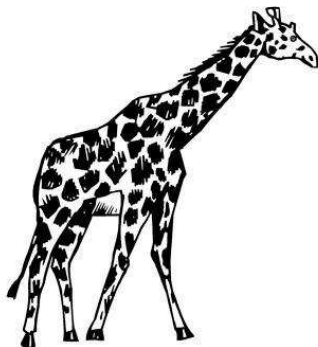
$$g = 9$$

$$g = 2$$

$$g = 3$$

$$g = 4$$

Multiplication



Substituting Variables Enrichment

Evaluate each expression.

$6.3 + f$ $f = 7.12$ 1. _____	$e \div 3$ $e = 4.71$ 2. _____
$7 \times m$ $m = 82.6$ 3. _____	$n - 9.54$ $n = 23$ 4. _____
$42.36 - u$ $u = 5.9$ 5. _____	$s \times 18.7$ $s = 6$ 6. _____
$53.8 + x$ $x = 6.94$ 7. _____	$y \div 5$ $y = 124.5$ 8. _____

Substituting Variables Enrichment (Answer Key)

1. $6.3 + f$ $f = 7.12$	<div>13.42</div>	2. $e \div 3$ $e = 4.71$	<div>1.57</div>
3. $7 \times m$ $m = 82.6$	<div>578.2</div>	4. $n - 9.54$ $n = 23$	<div>13.46</div>
5. $42.36 - u$ $u = 5.9$	<div>36.46</div>	6. $s \times 18.7$ $s = 6$	<div>112.2</div>
7. $53.8 + x$ $x = 6.94$	<div>60.74</div>	8. $y \div 5$ $y = 124.5$	<div>24.9</div>



Name: _____ Date: _____

Evaluation: Quest for the Unknown

Day 2: Evaluate algebraic expressions with one unknown and one operation (+, -, \times , \div with no remainders).

1. The teacher wanted to know the value of the bracelets in the chest. The value of the bracelets can be represented as $11b$ dollars. Evaluate the expression $11b$, for b equals 7 to find the value of the bracelets in the treasure chest.

2. Scott and Silvio counted gems on the largest crown. The gems were placed in equal groups of 8 around the crown. The expression which represents the number of gems in each group may be written as $\frac{n}{8}$. Evaluate $\frac{n}{8}$ for n equals 64.

3. The treasure map is torn. It shows you must walk eight steps toward the waterfall, but then the information is missing. The expression which represents the total number of steps you must walk to locate the buried treasure is $8 + s$. Evaluate the expression $8 + s$, for s equals 432 to the number of steps to locate the buried treasure.

4. Iliana reached into the treasure chest and grabbed many gold coins. The expression to represent the number of gold coins remaining in the chest is $347 - h$. Evaluate the expression $347 - h$, for h equals 19.

Name: _____ Date: _____

Evaluation: Quest for the Unknown



Answer Key

Day 2: Evaluate algebraic expressions with one unknown and one operation (+, -, x, ÷ with no remainders).

1. The teacher wanted to know the value of the bracelets in the chest. The value of the bracelets can be represented as $11b$ dollars. Evaluate the expression $11b$, for b equals 7 to find the value of the bracelets in the treasure chest.

_____ (\$77)

2. Scott and Silvio counted gems on the largest crown. The gems were placed in equal groups of 8 around the crown. The expression which represents the number of gems in each group may be written as $\frac{n}{8}$. Evaluate $\frac{n}{8}$ for n equals 64.

_____ (8)

3. The treasure map is torn. It shows you must walk eight steps toward the waterfall, but then the information is missing. The expression which represents the total number of steps you must walk to locate the buried treasure is $8 + s$. Evaluate the expression $8 + s$, for s equals 432 to the number of steps to locate the buried treasure.

_____ (440)

4. Iliana reached into the treasure chest and grabbed many gold coins. The expression to represent the number of gold coins remaining in the chest is $347 - h$. Evaluate the expression $347 - h$, for h equals 19.

_____ (328)

Engagement: Quest for the Unknown

Day 3: “Living” Expressions

0

1

2

3

4

5

6

7

8

9

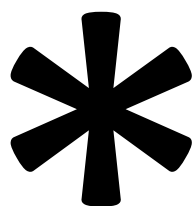
10

11

12

+

n



A cartoon illustration of a treasure chest with a yellow outline and a brown body, sitting on a green mound. In front of the chest is a large, ornate silver key with a decorative bow. The background is a light blue sky with a green ground area. The word 'es' is partially visible on the left side of the image.

Evaluate the numeric expressions

1) $24 - (3 + 4)$

Answer: _____

$$2) \quad 2(5 + 4)$$

Answer: _____

3) $21 \div (5 - 2)$

Answer: _____

4) $6 + (2 \times 6)$

Answer: _____

5) $(12 - 8) \times 2$

Answer: _____

6) $(36 + 12) \div 4$

Answer: _____

Independent Practice: Quest for the Unknown

Day 3: Evaluate a numeric expression that uses parentheses

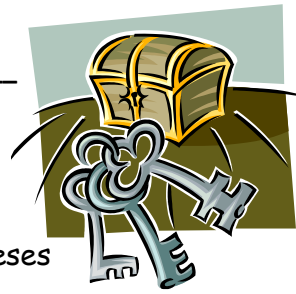
Evaluate the numeric expressions



Answer Key

1) $24 - (3 + 4)$	2) $2(5 + 4)$
Answer: 17	Answer: 18
3) $21 \div (5 - 2)$	4) $6 + (2 \times 6)$
Answer: 7	Answer: 18
5) $(12 - 8) \times 2$	6) $(36 \div 12) \div 4$
Answer: 8	Answer: 12

Name: _____ Date: _____



Evaluation: Quest for the Unknown

Day 3: Evaluate a numeric expression that uses parentheses

1. Lamar evaluated an expression and got 12. Which expression below could be evaluated to get 12?

Ⓐ $23 - (6 \times 5)$

Ⓑ $23(6 + 5)$

Ⓒ $\frac{23}{(6+5)}$

Ⓓ $23 - (6 + 5)$

2. Nicole displayed 14 crowns. Which expression represents the amount of crowns Nicole displayed?

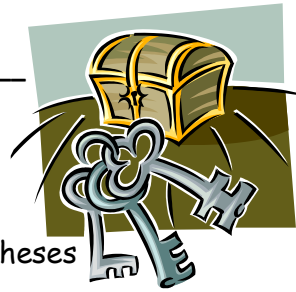
Ⓐ $14 - (2 \times 5)$

Ⓑ $\frac{14}{(2+5)}$

Ⓒ $2(2+5)$

Ⓓ $(2 + 5) - 2$

Name: _____ Date: _____



Answer Key

Evaluation: Quest for the Unknown

Day 3: Evaluate a numeric expression that uses parentheses

1. Lamar evaluated an expression and got 12. Which expression below could be evaluated to get 12?

Ⓐ $23 - (6 \times 5)$

Ⓑ $23(6 + 5)$

Ⓒ $\frac{23}{(6+5)}$

Ⓓ $23 - (6 + 5)$

2. Nicole displayed 14 crowns. Which expression represents the amount of crowns Nicole displayed?

Ⓐ $14 - (2 \times 5)$

Ⓑ $\frac{14}{(2+5)}$

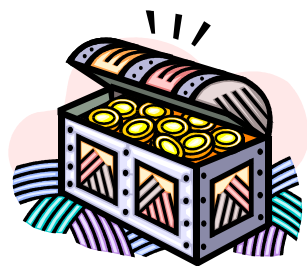
Ⓒ $2(2+5)$

Ⓓ $(2 + 5) - 2$

Name: _____ Date: _____

Post-Assessment: Quest for the Unknown

Directions: Fill in the best response.



1. Marcus and Paolo each found gold coins in the royal cave. Paolo has exactly 37 fewer gold coins. Let m represent the number of gold coins that Marcus has..

Which expression represents the number of gold coins that Marcus has?

Ⓐ $m \times 37$

Ⓑ $m - 37$

Ⓒ $m + 37$

Ⓓ $m \div 37$

2. The bus to the field trip has 14 students from your school. At the next school more students board the bus. Let s equal the number of students on the bus.

Which expression represents the number of bus riders?

Ⓐ $14 + s$

Ⓑ $14 \div s$

Ⓒ $14 - s$

Ⓓ $14 \times s$

3. Josie and her classmates entered the cave to find the treasure. They decided to break up in 6 equal groups. Let c equal the number of classmates in the cave.

Which expression represents the number of classmates in each group?

Ⓐ $c - 6$

Ⓑ $6 \div c$

Ⓒ $\frac{c}{6}$

Ⓓ $6 \times c$

4. Tomas is carrying a small bag of silver coins from the treasure cave. His teacher noticed that he can carry **6** bags. Each bag contains ***b*** coins.



Step A

Write an expression which represents the number of silver coins he can carry if each bag contains ***b*** coins.

Step B

If one bag holds 9 silver coins how many coins can Tomas carry? Explain how you determined your answer. Use what you know about evaluating expressions. Use words, numbers and/or symbols in order to determine your answer.

5. Rayleen found a silver coin and a gold coin on the treasure hunt. The total value of both coins is \$354. If the silver coin is worth \$19, what is the value of the gold coin?

- Ⓐ 235 Ⓑ 335
Ⓒ 435 Ⓓ 373

8. Abby found a long chain with 72 links. All the students in her group wanted to take home an equal amount of links from the chain. There were eight students in the group. A student stated the expression for this is $l \div 8$. If l represents the amount of links in the chain and every student takes home an equal number of links, how many links will each student take home?

Let $l = 72$

- Ⓐ 63 Ⓑ 648
Ⓒ 90 Ⓓ 9

9. Aaron wanted to display the jeweled crowns he found on the treasure hunt. His teacher said he could display the crowns on shelves in the classroom. Each shelf could hold four crowns. Let d represent the number of shelves in the classroom.

How many crowns can Aaron display if $d = 8$?

- Ⓐ 12 Ⓑ 2
Ⓒ 32 Ⓓ 4

10. The treasure map stated that there was a secret diamond room inside the cave with 16 heavy giant diamonds. Alina went into the cave twice and carried out four diamonds on the first trip and two diamonds on the second trip. Which expression represents the number of diamonds that remain in the secret room?

Ⓐ $16 - (4 + 2)$

Ⓑ $2(4 + 2)$

Ⓒ $(4 + 2) - 2$

Ⓓ $16 - (4 \times 2)$

11. During the treasure hunt, Gavin found three silver bracelets and Rydel found 2 silver bracelets. Dashawn found twice as many silver bracelets as Gavin and Rydel, together. Which expression represents the number of bracelets Dashawn found?

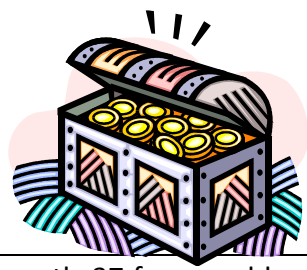
Ⓐ $10 - (3 + 2)$

Ⓑ $2(3 + 2)$

Ⓒ $\frac{10}{(3 + 2)}$

Ⓓ $10 - (3 \times 2)$

Answer Key: Post-Assessment: A Quest for the Unknown



Directions: Fill in the best response.

1. Marcus and Paolo each found gold coins in the royal cave. Paolo has exactly 37 fewer gold coins. Let m represent the number of gold coins that Marcus has..

Which expression represents the number of gold coins that Marcus has?

☐ (A) $m \times 37$

☒ (B) $m - 37$

☐ (C) $m + 37$

☐ (D) $m \div 37$

2. The bus to the field trip has 14 students from your school. At the next school more students board the bus. Let s equal the total number of students on the bus.

Which expression represents the number of bus riders?

☒ (A) $14 + s$

☐ (B) $14 \div s$

☐ (C) $14 - s$

☐ (D) $14 \times s$

3. Josie and her classmates entered the cave to find the treasure. They decided to break up in 6 equal groups. Let c equal the number of classmates in the cave.

Which expression represents the number of classmates in each group?

☐ (A) $c - 6$

☐ (B) $6 \div c$

☒ (C) $\frac{c}{6}$

☐ (D) $6 \times c$

4. Tomas is carrying a small bag of silver coins from the treasure cave. His teacher noticed that he can carry **6** bags. Each bag contains **b** coins.



Step A

Write an expression which represents the number of silver coins he can carry if each bag contains **b** coins.

$$6 \times b, 6b$$

Step B

If one bag holds 9 silver coins how many coins can Tomas carry? Explain how you determined your answer. Use what you know about evaluating expressions. Use words, numbers and/or symbols in order to determine your answer.

Possible student response should demonstrate understanding of replacing the variable in the above expression.

$$b = 9$$

$$6 \times b$$

$$6 \times 9$$

Tomas can carry **54** coins at one time.

5. Rayleen found a silver coin and a gold coin on the treasure hunt. The total value of both coins is \$354. If the silver coin is worth \$19, what is the value of the gold coin?

- Ⓐ 235
- Ⓑ 335
- Ⓒ 435
- Ⓓ 373

8. Abby found a long chain with 72 links. All the students in her group wanted to take home some links from the chain. There were eight students in the group. A student stated the expression for this is $l \div 8$. If l represents the amount of links in the chain and every student takes home an equal number of links, how many links will each student take home?

Let $l = 72$

- Ⓐ 63
- Ⓑ 648
- Ⓒ 90
- Ⓓ 9

9. Aaron wanted to display the jeweled crowns he found on the treasure hunt. His teacher said he could display the crowns on shelves in the classroom. Each shelf could hold four crowns. Let d represent the number of shelves in the classroom.

How many crowns can Aaron display if $d = 8$?

- Ⓐ 12
- Ⓑ 2
- Ⓒ 32
- Ⓓ 4

10. The treasure map stated that there was a secret diamond room inside the cave with 16 giant diamonds. Alina went into the cave twice and carried out four diamonds on the first trip and two diamonds on the second trip. Which expression represents the number of diamonds that remain in the secret room?

☒ (A) $16 - (4 + 2)$

☐ (B) $2(4 + 2)$

☐ (C) $(4 + 2) - 2$

☐ (D) $16 - (4 \times 2)$

11. During a treasure hunt, Gavin found three silver bracelets and Rydel found 2 silver bracelets. Dashawn found twice as many silver bracelets as Gavin and Rydel. Which expression represents the number of bracelets Dashawn found?

☐ (A) $10 - (3 + 2)$

☒ (B) $2(3 + 2)$

☐ (C) $\frac{10}{(3 + 2)}$

☐ (D) $10 - (3 \times 2)$